DETERMINING THE INVESTMENT IMPACT OF BULGARIA'S 2007-08 INCOME TAX REFORMS

Aleksandar Vasilev, University of Lincoln. E-mail: avasilev@lincoln.ac.uk

Abstract

This paper provides a quantitative assessment of the 2007-08 corporate and personal income tax reforms in Bulgaria. The simple investment model, based on Tobin's q-theory is calibrated to Bulgarian data before and after the reform. Based on numerical simulations, capital stock is predicted to double over the long run.

Keywords: corporate tax rate, personal income tax rate, tax reform, investment

JEL Classification: E22, E62, H25, O52

1. Introduction

This paper provides a quantitative assessment of the 2007-08 corporate and personal income tax reforms in Bulgaria. Starting from a rate of 32.5% in 2000, the corporate tax rate was decreased in several steps down to 10% in 2007. Similarly, the progressive income tax schedule was flattened until a uniform rate of 10% was introduced in 2008. In addition, a dividend tax of 5% was introduced. Those policies aimed to promote investment and economic growth through capital accumulation and increase in labor productivity. This paper will provide a quantitative assessment of the effect of the tax changes on the aggregate economy. The aim of the paper is thus twofold: first, the Baltic countries (Lithuania, Latvia, and Estonia) adopted similar tax reforms in the early 2000s and realized significant welfare gains from adopting such pro-market fiscal policies, as demonstrated in Funke and Strulik (2006) and Azacis and Gillman (2010). Therefore, those three countries could then provide a useful benchmark when analyzing Bulgaria's 2008 income tax reform as well. In addition, all four countries listed are European Union (EU) members and also share a similar history of transition from central planning to market economies.

Second, the very question of the nature of the taxation system is a controversial one and an issue that lies at the very heart of fiscal policy. Furthermore, direct income taxation is an important part of government revenue and is thus central for public finance management all over the world. When it comes to tax reforms in transition countries, the World Bank (2000) has advised them to redesign and reform their tax system design by grounding them in both theory and specific historical evidence, where both of those recommendations naturally pointed in the direction of simplifying tax systems by introducing a single bracket and a low statutory rate.

We aim to fill both those niches in the literature, in both its theoretical and practical aspects. In particular, the novelty relative to Vasilev (2015a,b, 2016b, 2017b) is that here we focus exactly on corporate profit and dividend taxation. Additionally, the Bulgarian tax reform in 2008 may be relevant for other transition and developing countries. The paper is organized as follows: Section 2 discussed the investment model used, Section 3 outlines the calibration procedure, and provides some simulation results, and Section 4 concludes.

2. The investment function

For the most part, we closely follow the setup in Funke (2002), who utilizes a simple Tobin's q-model of investment. In particular, we begin by considering a representative Bulgarian firm. For simplicity, we will assume that the firm finances all its investment expenditures from retained earnings, and thus abstract away from loan and debt finance aspects. This is not a bad assumption as these markets were not well-developed during the period.

The before-tax dividends at time *t* are then expressed as follows:

$$\pi_t = (1-\tau_t)F(K_t) + \tau_t D_t - f(I_t, K_t)I_t \ , \tag{1}$$

where π are the gross dividends, τ is the corporate tax rate, $F(K) = aK^{1-\beta}$ is the aggregate production function, *K* is the capital stock, *D* are the depreciation allowances, *I* is the gross investment, and the investment adjustment function $f(.)$ takes the quadratic form

$$f(I_t, K_t) = 1 + \alpha \frac{[\left(\frac{I_t}{K_t}\right) - \delta]^2}{2I_t/K_t}, \alpha > 0 \ , \tag{2}$$

The investment adjustment cost function satisfies the standard assumptions imposed in the literature, e.g: $f(0) = 0, f_I > 0, f_{II} > 0, f_K < 0$. These assumptions imply that the marginal cost of adjustment is monotone increasing in the size of the adjustment and monotone decreasing in the size of the current capital stock. In addition, for simplicity we have normalized the price of capital, investment and output all to be equal to unity.

Next, we define the tax system in order to study the firm's behaviour. In addition to the corporate tax rate defined above, we introduce a measure for the degree of discrimination between the treatment of retained earnings and dividend payouts. As in Funke (2002), this variable will be denoted by Θ and will be defined as the opportunity cost of retained earnings in terms of net dividends foregone, or:

$$\theta_t = \frac{1-m_t}{1-\tau_t} , \tag{3}$$

where *m* is the personal tax rate on dividend income. Next, we express the asset market no-arbitrage condition for the firm value, which is

$$rV_t = \theta_t \pi_t + \dot{V}_t, \tag{4}$$

where r is the constant after-tax discount rate. The representative firm maximizes the discounted after-tax dividends over time, hence

$$V(0) = \int_0^\infty \theta_t \, \pi_t e^{-rt} dt \tag{5}$$

or

$$V(0) = \int_0^\infty [\theta_t(1-\tau_t)F(.) - (\theta_t - z_t)f(.)I_t]e^{-rt}dt + A(0), \tag{6}$$

where *d* measures the depreciation allowance, and

$$A(0) = \int_0^\infty \theta_t \pi_t [\int_{-\infty}^0 d_{t-v,t} \, f(.)I_v dv]e^{-rt} \, dt \tag{7}$$

is the expression denoting the tax bill savings due to depreciation allowances on capital installed before the optimization horizon, while

$$z_t = \int_0^\infty \theta_{t+s} \, \tau_{t+s} d_{s,t} e^{-rs} ds \tag{8}$$

is the present discounted value of all depreciation allowances. Next, the law of motion for capital accumulation is

$$\dot{K} = I - \delta K. \tag{9}$$

The present-value Hamiltonian is

$$H = e^{-rt}[\theta_t(1-\tau_t)F.) - (\theta_t - z_t)f(.)I] + \lambda[I - \delta K], \tag{10}$$

where λ is the co-state variable. We define $q = \lambda e^{rt}$ to denote the present value of after-tax marginal product accruing to one Bulgarian lev (BGN) of capital installed in the same period. The optimality conditions are

$$q = (\theta - z)[f(.) + \frac{\partial f}{\partial I} I] \tag{11}$$

$$\dot{q} = (\theta - z)\frac{\partial f}{\partial K} I - \theta(1-\tau)\frac{\partial F}{\partial K} + (r+\delta)q \tag{12}$$

Lastly, the transversality (boundary) condition $\lim_{t\to\infty} qKe^{-rt} = 0$ iis imposed to prevent explosive solutions.

Next, for tax purposes, the firm can deduct *d=0.2* of the accounting value of its assets, which corresponds to a 5-year straight-depreciation scheme used in Bulgaria. Hence, in steady-state, $z^* = d\theta^* r^*$.

Next, to solve the model, we linearize the two first-order non-linear differential equations around the steady-state, which produces

$$\begin{pmatrix} \dot{K} \\ \dot{q} \end{pmatrix} = \begin{pmatrix} 0 & \frac{K^*}{ag^*} \\ \frac{\beta(r+\delta)g^*}{K^*} & r \end{pmatrix} \begin{pmatrix} K-K^* \\ q-q^* \end{pmatrix} + \begin{pmatrix} -\frac{K^*}{ag^*} & 0 \\ \delta & -\frac{(r+\delta)g^*}{\theta^*(1-\tau^*)} \end{pmatrix} \begin{pmatrix} g-g^* \\ \theta(1-\tau)-\theta^*(1-\tau^*) \end{pmatrix} \tag{14}$$

where $q = \theta - z$. The eigenvalues of the system are:

$$\mu_{1,2} = \frac{r \pm \sqrt{r^2 + 4\alpha^{-1}\beta(r+\delta)}}{2} \tag{15}$$

Since the system features a saddle-path stability, $\mu_1 > 0, \mu_2 < 0$. Given that the negative root is the table one, it follows that

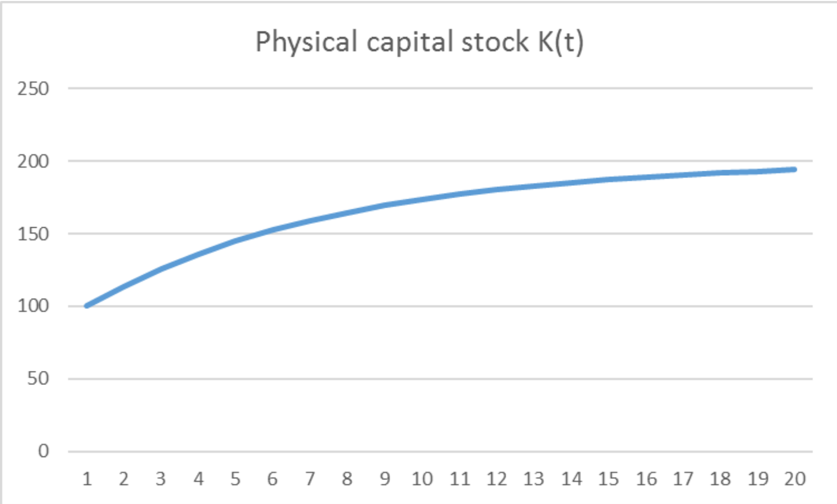
$$K - K^* = [K(0) - K^*]e^{\mu_2 t} \tag{16}$$

$$q - q^* = \left(\frac{\mu_2 \alpha g^*}{K^*}\right)(K - K^*) \tag{17}$$

3. Calibration results

In order to provide a quantitative assessment of the fiscal reforms in Bulgaria POST-2008, we will calibrate the theoretical model, i.e. we will assign values (based on data) for model parameters so that the economy approximates Bulgarian data along the relevant dimensions. As in Vasilev (2017a), capital share in the production function is set to $\beta = 0.571$. As in Funke (2002), the scale parameter *a* in the production function was chosen so that the initial level of capital stock equals 100. The depreciation rate of physical capital is $\delta = 0.047$ as in Vasilev (2016). The tax discrimination variable is $\theta = 1$ before the reform, and $\theta = 0.944$ after Jan.1, 2008. The discount rate equals $r^* = 0.05$ as in Vasilev (2016a). As in Vasilev (2019), we set the parameter for the investment adjustment cost $\alpha = 6$.In turn, these values produce $\mu = -0.1484$ for the stable eigenvalue, which we use to produce the path of physical capital after the reform. The simulation results for the capital stock are presented in Fig. 1 on the next page. The results support our claim that firms will change their behaviour and invest more after the reform. In particular, in the long run capital stock is predicted to double (from 100 to 200). Thus, the corporate tax reform stimulates growth by capital accumulation domestically, and/or by inflow of foreign capital from abroad. Furthermore, this numerical simulation is consistent with evidence in the Baltics, who introduced similar reforms in 2000s, e.g Funke (2002).

Fig. 1. Trajectory of physical capital stock post-reform



4. Conclusions

We use a simple model to study the effects of recent fiscal reforms in Bulgaria. To provide a quantitative assessment, we calibrated the setup to Bulgarian data – before and after the reforms in personal and corporate tax rates, as well as dividend taxation. The numerical results based on simulations suggest that the reforms encourage investment, and stimulate growth through capital accumulation.

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